

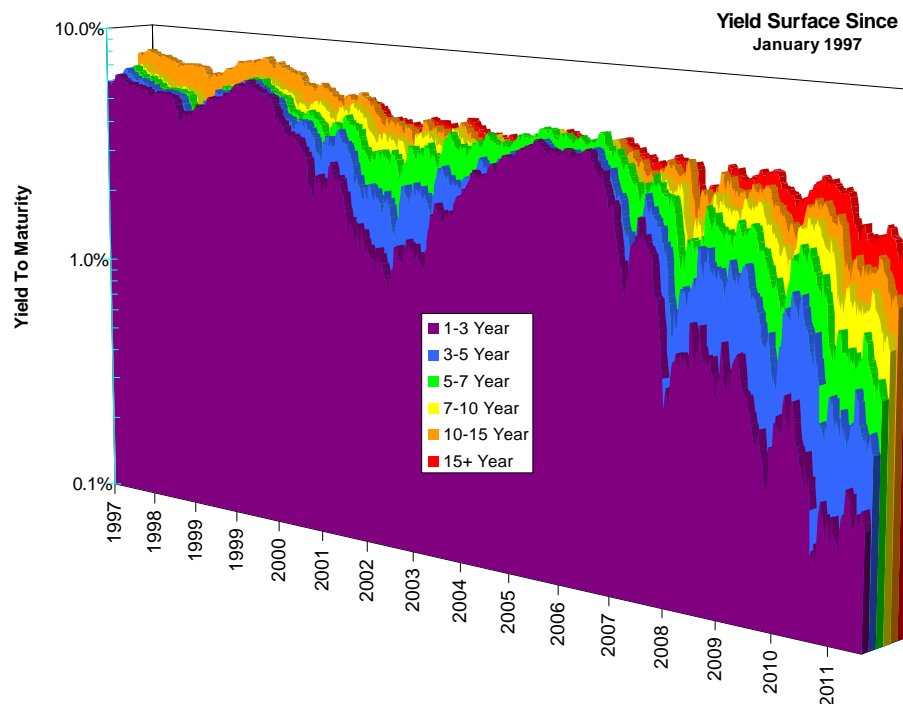
Convexity And Bond Market Perplexity

An occupational hazard in financial markets is whatever happened, there is always someone there to tell you after the fact why it was bound to have happened. You just have to chalk those encounters up to experience, smile and get on with the rest of your day.

The simple fact of the matter is markets move much further and much faster than we ever believe possible, and generally in a direction that leaves the greatest collection of treadmarks across participants' chests. The reason for this is deceptively simple: You take action to insure yourself against expected adverse events and therefore leave yourself open to the unexpected adverse event. More cruelly, most of us consider windfall gains to be unexpected and therefore tend to close them early on in the life of the trade only to rejoin the parade at the end. Capitulations result, both higher and lower. This aspect of market behavior seems to be immutable.

So saying, would anyone ever have stood in 1981 and forecast ten-year Treasury yields, then in the neighborhood of sixteen percent, would have dropped below 1.40 percent thirty years later? Moreover, if you had told them this would be the case and asked them to describe the environment wherein yields were this low, they would have guessed the federal deficit had been tamed, the current account deficit had been brought back to manageable levels, the dollar would be strong, the yield curve would be flat, commodity prices would be low and the Federal Reserve would be starving the banking system for funds. The exact opposite environment prevailed throughout much of 2011-2012.

The real surprise would have been how low short-term interest rates would have been and for how long of a period of time. No one foresaw the possibility of near-zero percent short-term interest rates for close to five years or a yield curve steepening bullishly with inflation remaining under control. The extent of this move over a set of fixed-income maturities since 1997 is depicted below on a logarithmic scale to highlight percentage changes.



Duration And Convexity

How could we have known this was bound to have happened? Let's go back to two aspects of fixed-income behavior, duration and convexity. Duration is the expected change in a bond's price for a hundred basis point change in yield. The lower interest rates get along the yield curve, the more the duration approaches the bond's maturity. The duration of a zero-coupon bond is its maturity.

Convexity is the rate at which duration changes as a function of yields. Greed may or may not be good, but convexity always is valuable: The higher it is, the more the bond gains as rates fall and the less the bond loses as rates rise. For those of you comfortable with option Greeks, think of duration and convexity as you might delta and

gamma. Indeed, the duration of two different bonds defines a ratio at which one can be borrowed (sold) to lend (buy) the other.

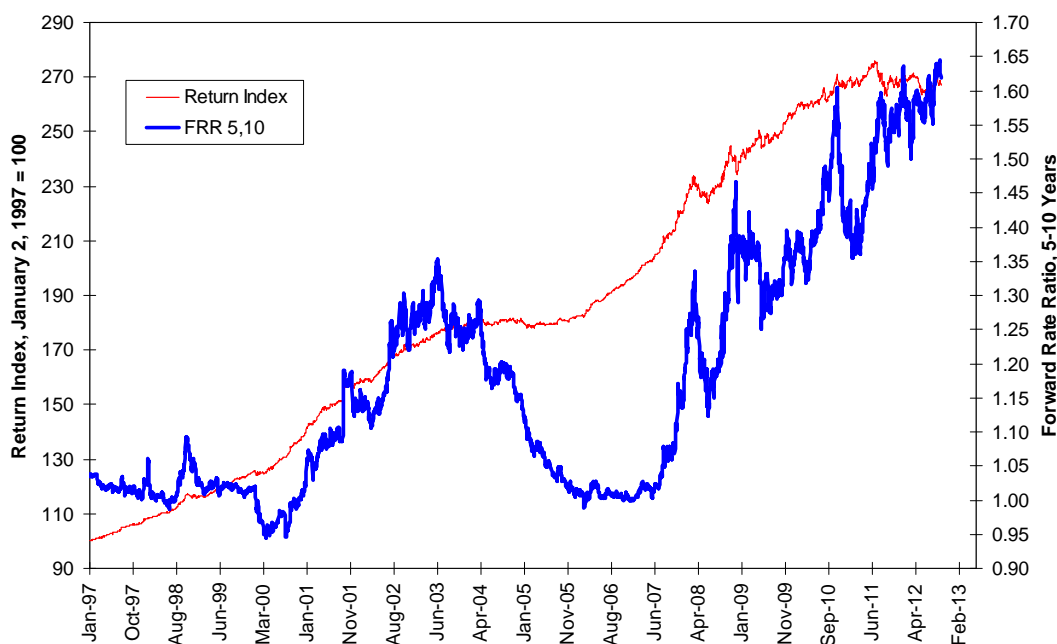
This hedge ratio establishes what we can call a duration-neutral yield curve flattener. This is the trade where a hedge ratio quantity of shorter-dated bonds is borrowed to lend into the longer-dated bond. The steeper the yield curve, the more attractive this flattening trade becomes. Moreover, the greater the convexity gains from the trade, the more attractive it becomes.

Here's a mental image to guide you through the process by which these duration-neutral bullish flatteners: Think of squeezing a tube of toothpaste where the closed end is the short end of the yield curve and the opening is the long end. Each successive segment of the yield curve flattens from the shortest maturities on up to the end. The Federal Reserve accelerated this process in August 2011 with its first Operation Twist of selling short-term Treasuries and buying long-term Treasuries.

Five Will Get You Ten

Let's focus on one of these yield curve segments, that between the five- and ten-year Treasuries, and see how the trade has advanced over time. The total return on the duration-neutral bullish flattener of borrowing five-year Treasuries and lending into the ten-year Treasury is depicted below. The hedge ratio at the time of this writing is 1.929; since the trade's startdate in January 1997, the hedge ratio has ranged from 1.65 to 1.98. The total return of the trade has marched higher for a very long period of time with only a few pullbacks and pauses; this is quite a tribute to a trade few actually embrace.

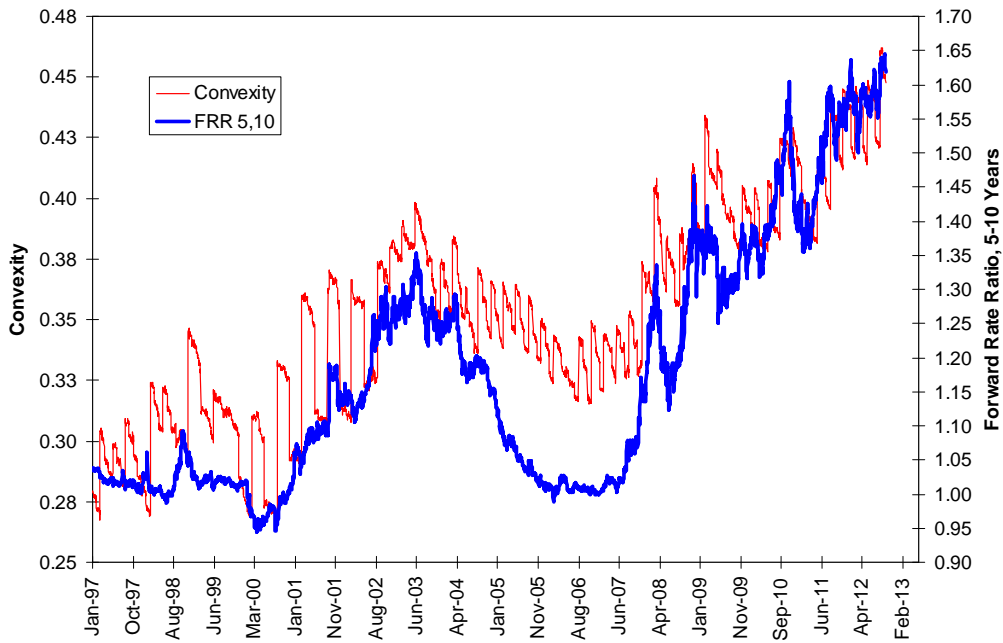
Return On Five-Ten Year Treasury Trade As Function Of Yield Curve



The total return is mapped against the forward rate ratio between five and ten years; this is the rate at which we can lock in borrowing for five years starting five years from now, divided by the ten-year rate. The more this $FRR_{5,10}$ exceeds 1.00, the steeper this segment of the yield curve and the more attractive the flattening trade becomes.

Now let's look at the trade's convexity over time. The map below contains a large number of discontinuities; these are simply the switch in the active or "on-the-run" Treasury notes following various auctions. The steeper the $FRR_{5,10}$, the greater the convexity has been over time.

Convexity Of Five-Ten Year Treasury Trade Versus Yield Curve

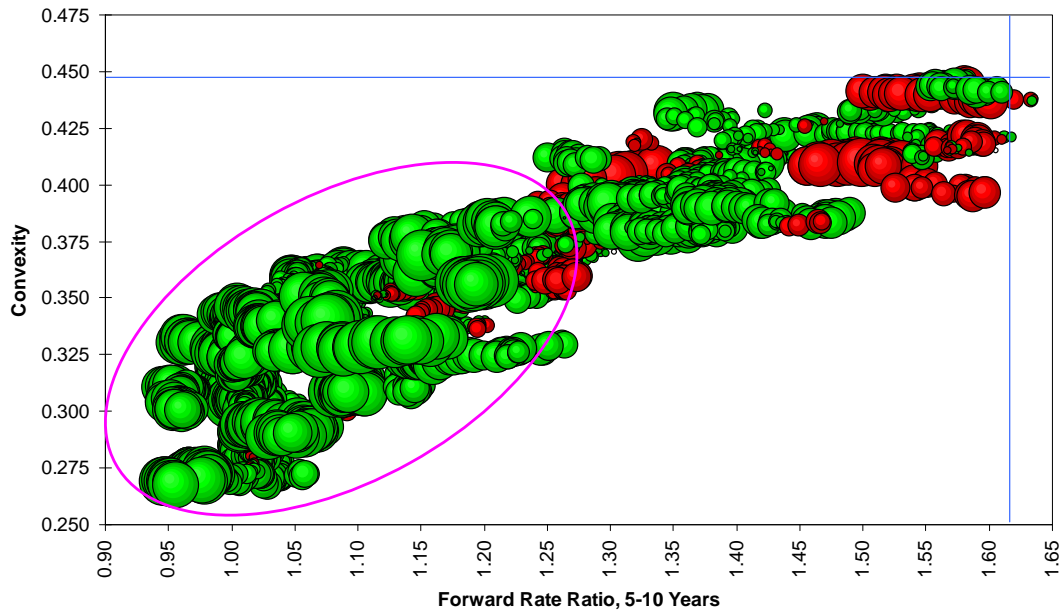


The toothpaste-tube analogy should start to make sense about now; as shorter maturities' yields get squeezed lower, the yield curve between them and longer maturities gets steeper. That steepness leads to selling the short-end and buying the long-end of the yield curve and obtaining convexity in the process, all while remaining duration-neutral. Once the low-hanging fruit of the shorter segment is exhausted, traders move out along the yield curve and push yields at the long end lower.

Prospective Returns

What does any given environment say about three month-ahead returns on this trade? Let's take a look at this over time as a function of convexity and the FRR_{5,10}. Positive returns are depicted in green bubbles; negative in red bubbles. The diameter of the bubble corresponds to the absolute magnitude of the return. The environment at the time of this writing is depicted with a blue bombsight.

Three Month-Ahead Return On Five-Ten Year Trade As Function Of Yield Curve And Convexity



The largest prospective gains have occurred in the southwestern region of the map, highlighted with an oval. The best time to execute the bullish flattener has been when the yield curve was flat-to-inverted and while the net convexity of the trade was low. The environment prevailing after the Federal Reserve's post-2007 moves has been decreasingly rewarding for the trade.

Now let's return to the nature of the unexpected. Traders of all stripes chase diminishing returns and push trades to the bitter end. We should expect this to happen here as well; it did ten years ago this month in Japan. Then ten-year Japanese government bond yields fell to their all-time low of 0.438% on June 11, 2003, and touched 0.88% on June 30, 2003. Restated, yields doubled in less than three weeks.

Did those who decided to lend the Japanese government money at 43.8 basis points in mid-June 2003 do so believing they stood to make a capital gain or to finance their retirements with that yield? We cannot say for sure, but the answer is probably, "no." It was probably duration traders just doing their job. That is how it will end here, too.